Coverage and metadata availability of African publications in OpenAlex: A comparative analysis

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Unlike traditional proprietary data sources like Scopus and Web of Science (WoS), OpenAlex emphasizes its comprehensive coverage, particularly highlighting its inclusion of the humanities, non-English languages, and research from the Global South. Strengthening diversity and inclusivity in science is crucial for ethical and practical reasons. This paper analyses OpenAlex's coverage and metadata availability of African-based publications. For this purpose, we compare OpenAlex with Scopus, WoS, and African Journals Online (AJOL). We first compare the coverage of African research publications in OpenAlex against that of WoS, Scopus, and AJOL. We then assess and compare the available metadata for OpenAlex, Scopus, and WoS publications. Our analysis shows that OpenAlex offers the most extensive publication coverage. In terms of metadata, OpenAlex offers a high coverage of publication and author information. It performs worse regarding affiliations, references, and funder information. Importantly, our results also show that metadata availability in OpenAlex is better for publications that are also indexed in Scopus or WoS.

1. Introduction

OpenAlex was launched in January 2022 as a fully open source of scholarly metadata to improve transparency, evaluation, representation, and discovery of research (Priem et al., 2022). Despite it is still in an early stage of development, OpenAlex is a promising source of open and reproducible bibliometrics and is already making impact in specific academic contexts. For instance, in December 2023, Sorbonne University switched from using Web of Science (WoS) to OpenAlex, and in January 2024, the Centre for Science and Technology Studies (CWTS) at Leiden University released the new Leiden Raking Open Edition based on OpenAlex data.

Along with its increasing popularity, OpenAlex has been the subject of academic research, mainly focusing on the coverage of its metadata. In a recent publication, Culbert et al. (2024) found that OpenAlex's reference coverage is comparable to that of Scopus and WoS for the 2015-2022 period, with higher coverage for some metadata fields, such as ORCID. However, a smaller scale analysis by Delgado-Quirós and Ortega (2024) revealed that while OpenAlex has a high metadata coverage for certain fields, especially those retrieved from Crossref, it also inherits some of the limitations of Microsoft Academic Graph (MAG), resulting in a high proportion of missing values for some bibliographic data fields, such as volume, issue, and pages.

1.1 OpenAlex and inclusivity

Unlike traditional proprietary data sources like Scopus and WoS, OpenAlex emphasizes its database's comprehensiveness rather than its content's selectivity. It claims to offer extra broader coverage of the humanities, non-English languages, and research from the Global South[1]. Strengthening diversity and inclusivity in science is crucial for both ethical and practical reasons. Biases in traditional data sources regarding research fields, languages, or regions ignore much of the research necessary to bridge disciplinary, linguistic, and regional gaps. Leaving relevant knowledge outside data sources makes accessing relevant information more challenging and impacts those who could benefit from it (e.g., Moscona & Sastry, 2021). In a recent article, Asubiaro et al. (2024) found that journals published in sub-Saharan Africa were the most underrepresented in Scopus and WoS compared to other regions. In a previous study, Asubiaro and Onaolapo (2023) confirmed the limited coverage of mainstream bibliographic data sources and highlighted the possibilities of alternative sources like Crossref (Asubiaro & Onaolapo, 2023). Previous studies have also highlighted the limitations of metadata availability for publications from the Global South, such as the absence of DOIs (Turki et al., 2023).

1.2 Objective

This paper follows previous research on OpenAlex, focusing on the coverage and metadata availability of African-based publications. For this purpose, OpenAlex is compared in this paper with two major proprietary bibliographic data sources, Scopus and WoS, as well as with African Journals Online (AJOL), a specific platform that covers African research. Although AJOL is not a full-fledged bibliographic data source like the other three, it indexes African-based journals and their publications to improve their impact and visibility. Therefore, it can be used to assess OpenAlex coverage of research outside the mainstream knowledge circuits.

We first compare the coverage of African research publications in OpenAlex to that in Scopus, WoS, and AJOL. We then assess and compare the available metadata for those publications in OpenAlex, Scopus, and WoS. AJOL is not included in this comparison as the platform is not a metadata provider. Finally, we compare the metadata availability of two subsets of publications indexed in OpenAlex: publications only indexed in OpenAlex, and publications indexed in both OpenAlex and Scopus or WoS. We expect publications covered in Scopus or WoS to have a high metadata availability. Confirming this hypothesis, along with the results of the coverage analysis, will contribute to the discussion about OpenAlex's suitability for bibliometric analyses.

2. Data and methods

2.1 Data sources

Our analysis focuses on all publications published in African-based academic journals between 1996 and 2022 and that are available in OpenAlex, Scopus, WoS, and AJOL. We use only publications in academic journals and limit the time period to ensure a fair comparison and

[1] https://openalex.org/

avoid biases in the coverage analysis due to specific properties of each data source. For instance, AJOL exclusively covers journal publications, and Scopus only includes publications from 1996 onwards. The versions of the data sources used in the analysis are as follows:

- OpenAlex: We used the OpenAlex snapshot released in November 2023.
- WoS: We used the CWTS in-house version of WoS, updated until September 2023. our analysis considers the Science Citation Index Expanded (SCIE), the Social Sciences Citation Index (SSCI), the Arts & Humanities Citation Index (AHCI), and the Emerging Sources Citation Index (ESCI).
- Scopus: We used the CWTS in-house version of Scopus, updated in April 2023.
- AJOL: We used AJOL data retrieved from the AJOL website in February 2024 using the R libraries *ojsr* (Becerra, 2022) and *rvest* (Wickham, 2022).

Using each of the above-mentioned data sources, we selected all journals located in an African country and retrieved the ISSNs of those journals. We then constructed a journal master list by combining all the retrieved ISSNs to prevent inconsistencies between the geographical classification criteria used by the different data sources. Next, we collected all the publications belonging to the journals in the master list from all four data sources. Table 1 shows the original set of journals retrieved from each data source and the number of journals retrieved when the master list was applied. The numbers show that there are indeed inconsistencies between the geographical criteria applied by each data source as Openalex, Scopus, and WoS highly increased their number of African-based journals from the first set to the second one.

Table 1. African-based journals as reported by each data source and the final set of journals after using a merged master list

	OpenAlex	Scopus	WoS	AJOL
# African-based journals	3,115	391	276	739
# journals from master list	3,511	589	434	739

Table 2 shows the number of publications retrieved from each data source after restricting the publication venue to journal and the publication year to the period 1996-2022. Compared to Table 1, it is worth noting that the final number of publications in both Scopus and WoS is higher than in AJOL, even though the number of journals is smaller.

Table 2. Number of African research publications included in each data source

	OpenAlex	Scopus	WoS	AJOL
# publications	1,055,096	392,625	357,879	204,997

2.2 Publication coverage analysis

The publication coverage analysis was conducted using an exact match on DOI. We compared OpenAlex to the other data sources to assess its coverage of both indexed and non-indexed publications. This step required DOI deduplication, as some publications in each of data sources were attributed to the same DOI. We removed these publications from the analysis

because it was not possible to determine the correct publication record for each DOI. Table 3 compares the erroneous cases in the DOI match between data sources.

Table 3. Number of African research publications without a DOI, with a non-unique DOI, and with a unique DOI

	OpenAlex	Scopus	WoS	AJOL
# publications without a DOI	163,903	91,181	79,973	109,781
# publications with a non-unique DOI	212	952	270	540
# publications with a unique DOI	890,981	300,492	277,636	94,708

2.3 Metadata coverage analysis

The metadata coverage analysis compared the population of the metadata fields across the three academic data sources: OpenAlex, Scopus, and WoS. AJOL was excluded from this part of the analysis because it is not a metadata provider. While some metadata fields from AJOL publications can be retrieved via web scraping, the platform lacks an export feature similar to those available in OpenAlex, Scopus, or WoS.

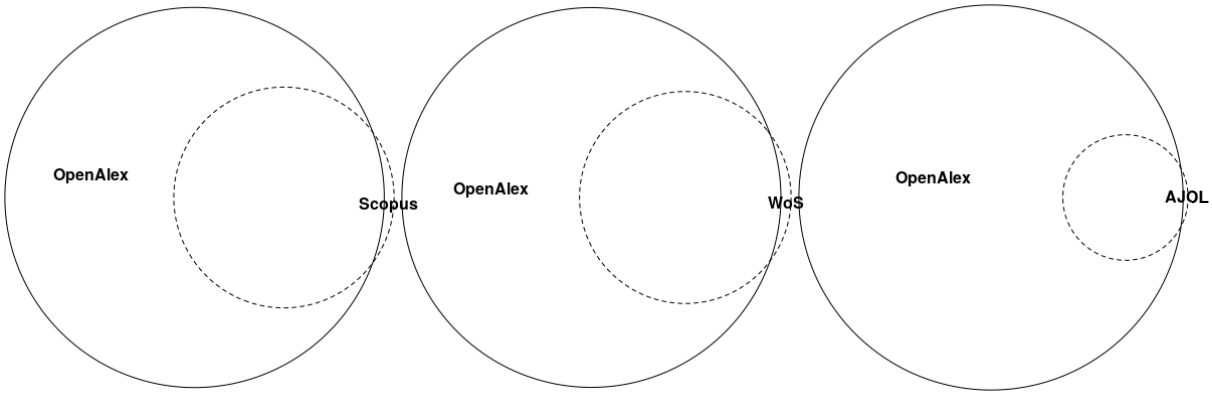
Metadata coverage was compared using all publications in each data source published in journals between 1996 and 2022 (Table 2), regardless of whether they have a DOI. For the metadata analysis of OpenAlex's subsets, we used the publication matches from the coverage analysis, including only publications with a DOI (as shown in the last row in Table 3).

3. Results

3.1 Comparison of publication coverage

Figure 1 shows the differences in the coverage of publications between OpenAlex on the one hand and Scopus, WoS, and AJOL on the other. As mentioned, this comparison is restricted to publications with a DOI. With more than 890 thousand publications, OpenAlex is unsurprisingly the most extensive data source, followed by Scopus with 300 thousand publications. AJOL shows a smaller coverage due to its high percentage of publications without DOIs (46%; see Table 2 and Table 3). Overall, the Figure shows that OpenAlex offers extensive coverage of publications, covering 97% of both Scopus and WoS publications. Compared to AJOL, OpenAlex includes almost all publications in the regional data source (98%), along with other publications not covered by AJOL. OpenAlex therefore seems to be a comprehensive source regarding publications not indexed by Scopus and WoS. Since all data sources contain publications without DOIs, the accuracy of the comparison might be improved by also including publications without DOIs, especially in the case of AJOL.

Figure 1. Overlap of African research publications with a DOI between OpenAlex and Scopus, WoS, and AJOL



OpenAlex: 890,981	OpenAlex: 890,981	OpenAlex: 890,981
Overlap: 293,436	Overlap: 270,570	Overlap: 93,225
Scopus: 300,492	WoS: 277,636	AJOL: 94,708

3.2 Comparison of metadata coverage

Table 4 shows the metadata coverage of OpenAlex, Scopus, and WoS. To enhance readability of the table. the following colors are used: green indicates that more than 75% of the publications have data for that field, yellow between 50 and 75% of the publications have data, orange represents a coverage between 25 and 50%, and red denotes a coverage below 25%. Following previous research on this topic, we have divided metadata into different dimensions (Velez-Estevez et al., 2023; Singh & Singh, 2023):

- Publication information: The table shows that all data sources have good DOI coverage, with OpenAlex presenting a slightly higher percentage of publications with DOI. Other identifiers were not used in the comparison due to their limited use across disciplines (PMID, PMCID, arXiv ID) or to their use by specific data sources (MAG ID, which only appears in OpenAlex due to OpenAlex's use of Microsoft Academic Graph data). Regarding bibliographic data, OpenAlex shows a higher overall coverage, whereas WoS is the data source with lower coverage for the issue field. Scopus shows a low coverage for the date field. Regarding the page and article number fields, it is important to note that they are complementary. This is because Scopus and WoS provide either page numbers or article numbers, depending on the data available in the publication. When adding the percentages of the first page and article number, the coverage of Scopus and WoS increases to almost 100% and 99%, respectively. In the case of OpenAlex, article numbers are usually reported in the page fields.

  Regarding Open Access (OA) information, both OpenAlex and WoS report the OA status for all their publications. Scopus, however, reports the status for slightly less than 75% of the publications.

Concerning the content dimension, a title is provided for almost all publications in the data sources (except for 1% of OpenAlex publications). Scopus and WoS also have a high coverage of abstracts, while the coverage in OpenAlex is lower (72%). OpenAlex does not include author keywords, which are available in Scopus and WoS. However, OpenAlex provides generated keywords for over 80% of its publications, WoS has a coverage of only 65%, and Scopus does not include this field at all.

Finally, almost all publications in the three data sources have information about their type and language, although it is worth noting that the type information in Scopus and WoS is more detailed compared to OpenAlex.

- Author information: Authors are provided for most of the publications across all three data sources, with coverage consistently above 95%. OpenAlex has a slightly lower coverage (96%) compared to Scopus and WoS (99% in both cases). Regarding author identifiers (ORCID), the coverage is below 50% in all data sources. However, it is interesting to see that the availability of ORCIDs is significantly better in OpenAlex (44%) compared to Scopus and WoS (22 and 10%, respectively).
- Affiliation and institution information: Affiliations and institutions are provided for most publications in Scopus and WoS. OpenAlex includes affiliation data for 60% of its publications, and institution data for less than 50% of its publications (49%). However, while neither Scopus nor WoS provides institution identifiers (ROR IDs), OpenAlex provides these identifiers for all publications with assigned institutions.
- Reference and citation information: The coverage of references is significantly higher in Scopus and WoS compared to OpenAlex (89% and 95%, respectively in Scopus and WoS, compared to 45% in OpenAlex). This difference is partly due to OpenAlex containing only linked references (i.e., references that point to publications that are also included in OpenAlex). Additionally, some publications in OpenAlex are missing complete reference lists, further contributing to the lower coverage.
- Funding information: Funding information is limited in all three data sources. WoS offers the highest number of publications with funders compared to Scopus and OpenAlex. Both Scopus and WoS provide the full text of the acknowledgments, while OpenAlex does not have this information. Although OpenAlex also provides the ROR IDs of funders, the coverage is equally low at 6%.

Table 4. Metadata coverage of African research publications in OpenAlex, Scopus, and WoS

Metadata field	OpenAlex		Scopus		WoS	
	Number	Percentage	Number	Percentage	Number	Percentage
Publications	1,055,096	-	392,625	-	357,879	-
Publication information						
Identifiers						
DOI	891,193	85	301,444	77	277,906	78
Bibliographic data						
Date	1,055,096	100	157,851	40	240,530	67

Year	1,055,096	100	392,625	100	357,879	100
Volume	923,477	88	387,230	99	323,301	90
Issue	776,954	74	257,196	66	214,443	60
Article number	-	-	143,664	37	142,216	40
First page	786,080	75	247,126	63	211,341	59
Last page	776,995	74	234,064	60	211,341	59
OA status						
OA status	1,055,096	100	292,673	75	357,879	100
Content						
Title	1,047,394	99	392,623	100	357,879	100
Abstract	763,341	72	353,930	90	311,889	87
Author keywords	-	-	193,651	49	176,619	49
Generated keywords	876,803	83	-	-	233,819	65
Other						
Type	1,055,096	100	392,625	100	357,879	100
Language	1,032,565	98	392,621	100	357,879	100
Author information						
Authors	1,009,860	96	388,584	99	354,973	99
ORCIDs	463,846	44	85,168	22	35,765	10
Affiliation and institution information						
Affiliations	639,027	61	374,451	95	339,386	95
Unified institutions	509,518	49	371,892	95	309,265	86
ROR IDs	509,518	49	-	-	-	-
Reference and citation information						
References	474,385	45	348,936	89	338,662	95
Funding information						
Funding text	-	-	65,207	17	117,218	33
Funders	65,795	6	63,079	16	118,224	33
ROR IDs	58,264	6	-	-	-	-

When publications only included in OpenAlex (subset 1) are compared with those also indexed in Scopus or WoS (subset 2), the latter group shows a consistently higher metadata availability (Table 5). These differences are especially noticeable for abstracts, generated keywords, ORCIDs, affiliation and institution information, reference and citation information, and funding information. Overall, OpenAlex shows a relatively high metadata coverage for publications also included in Scopus or WoS (subset 2). When the results of subset 2 in Table 5 are compared to the results in Table 4 (keeping in mind that the publication sets in Table 3 also include publications without DOI), reveals that OpenAlex's metadata availability is much more comparable to that of Scopus and WoS. In particular, metadata availability is similar for the date, year, volume, type, language, and author fields. Regarding OA status, OpenAlex shows a similar coverage to Scopus and WoS. For references, the coverage in OpenAlex is slightly lower than in Scopus and WoS. Other fields, namely generated keywords and ORCIDs,

have a higher coverage in OpenAlex. Finally, issue, page and article number (when combined), affiliations, and funding information fields show a lower coverage.

Table 5. Metadata coverage of African research publications in OpenAlex subsets

Metadata field	***Subset 1:* Publications only in OpenAlex**		***Subset 2:* Publications in OpenAlex or Scopus**	
	Number	Percentage	Number	Percentage
Publications	584,977	-	306,216	-
Publication information				
Bibliographic data				
DOI	584,977	-	306,216	-
Date	584,977	100	306,216	100
Year	584,977	100	306,216	100
Volume	490,645	84	286,055	93
Issue	475,787	81	166,085	54
Article number	-	-	-	-
First page	417,335	71	233,743	76
Last page	415,161	71	233,685	76
OA status				
OA status	584,977	100	306,216	100
Content				
Title	577,283	99	306,210	100
Abstract	360,395	62	285,668	93
Author keywords	-	-	-	-
Generated keywords	425,415	73	302,027	99
Other				
Type	584,977	100	306,216	100
Language	565,343	97	304,610	100
Author information				
Authors	542,083	93	303,891	99
ORCIDs	171,407	30	237,952	78
Affiliation and institution information				
Affiliations	320,852	55	258,323	84
Unified institutions	214,332	37	250,981	82
ROR IDs	214,332	37	250,981	82
Reference and citation information				
References	178,987	31	259,487	85
Funding information				
Funding text	-	-	-	-
Funders	5,933	1	60,443	20

ROR IDs	5,686	1	53,125	17

4. Conclusions

Our analysis shows that OpenAlex offers the most extensive coverage of the African publishing system. It covers the majority of African research publications with a DOI indexed in Scopus, WoS, and AJOL. In addition, OpenAlex includes many publications that are not available in any of the other three data sources. This extensive coverage may enhance the visibility of scientific publications beyond the mainstream circuits of knowledge, thereby improving diversity in science, and reducing the disciplinary, linguistic, and regional gaps often present in traditional bibliometric sources.

If we look at the metadata coverage of African research publications, it can be seen that OpenAlex offers a high coverage for publication and author information. Notably, OpenAlex excels in fields such as issue, pages, generated keywords, and ORCIDs, where its coverage is higher than that of the proprietary data sources. Coverage of affiliations, references, and funder information seems somewhat lower in OpenAlex. However, it is important to note that the number of African research publications covered in OpenAlex is much larger than Scopus and WoS. Although the reasons behind the inclusion and exclusion criteria of each data source are beyond the scope of this paper, previous studies have highlighted the biases of traditional bibliographic databases (Asubiaro & Onaolapo, 2023; Chavarro, Rafols & Tang, 2018). OpenAlex's broader coverage of traditionally underrepresented regions could help address these biases and provide a more comprehensive view of the global scientific landscape.

When focussing on publications also indexed in Scopus or WoS, it turns out that the metadata availability in OpenAlex is for most fields, including affiliations, references, and funding information, similar to or even better than in the two proprietary data sources. Although the results presented here suggest that OpenAlex might be a competent source for scientometric analyses, especially for publications also included in Scopus and WoS, they must be taken cautiously as the availability of other metadata fields might vary between publications with DOI and without DOI. Additionally, the results show that OpenAlex's metadata coverage is more limited for publications not included in the other data sources. Finally, the quality and accuracy of the metadata in OpenAlex require further evaluation. Despite these limitations, OpenAlex's comprehensive coverage is a promising step to improve the diversity and inclusivity of scientometric analyses.

Open science practices

The OpenAlex data (obtained from the OpenAlex snapshot) and AJOL data (retrieved from the AJOL website) used this paper is openly available. This is not the case for the data obtained from the Scopus and WoS databases. Due to license restrictions, we are not allowed to redistribute Scopus and WoS data and the data used in this paper can therefore not be made available.

Author contributions

Patricia Alonso-Álvarez: Conceptualization, Methodology, Formal analysis, Writing – original draft. Nees Jan van Eck: Conceptualization, Methodology, Writing – review & editing.

Competing interests
The authors have no competing interests.

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